Document Title

DK7102-01 User Manual

Revision History

Rev. No.	History	Date	REV. BY
1.0	Initial issue.	Jun. 25, 2007	Jones
1.1	Modify 'Button Status' & 'Show LCD' display	Jul. 23. 2007	Jones
1.2	Logo changed.	Nov. 5th, 2007	Jones
2.0	New user interface	Jan. 8th, 2008	Jones
2.1	Add new test function "Direct Mode & sequence Dot"	Apr. 8th, 2008	Jones

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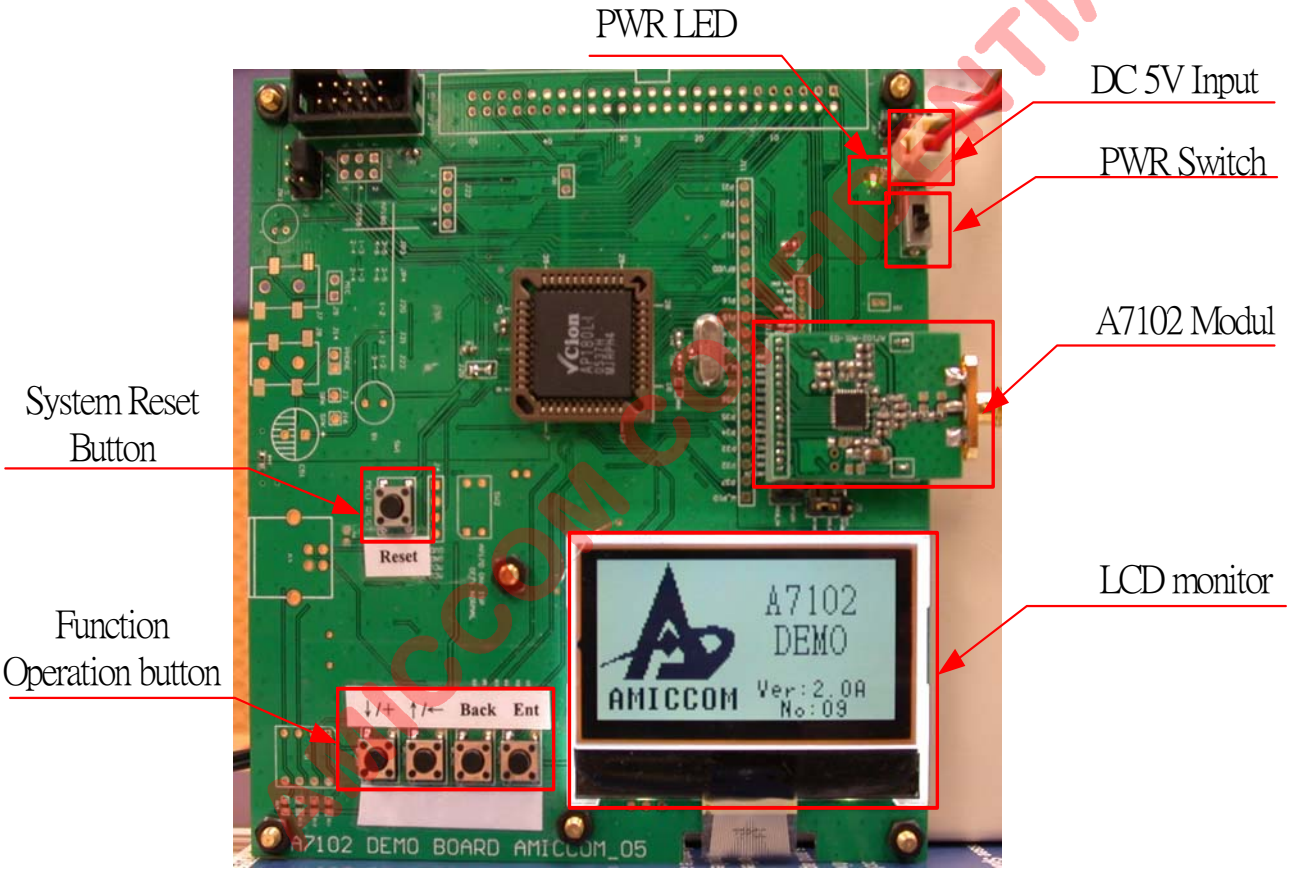
A7102 DEVELOPMENT KIT(DK) User Manual

◆ Introduction：

- A7102 Development board (DK7102) is used for demo and supporting developing the wireless application IC "A7102" with 315/433/868/915MHzISM frequency section provided by AMICCOM.

  ※Be notice, in this DK7102, A7102 is enabled by FIFO mode to do wireless transmission.

- Appearance:



HW version A

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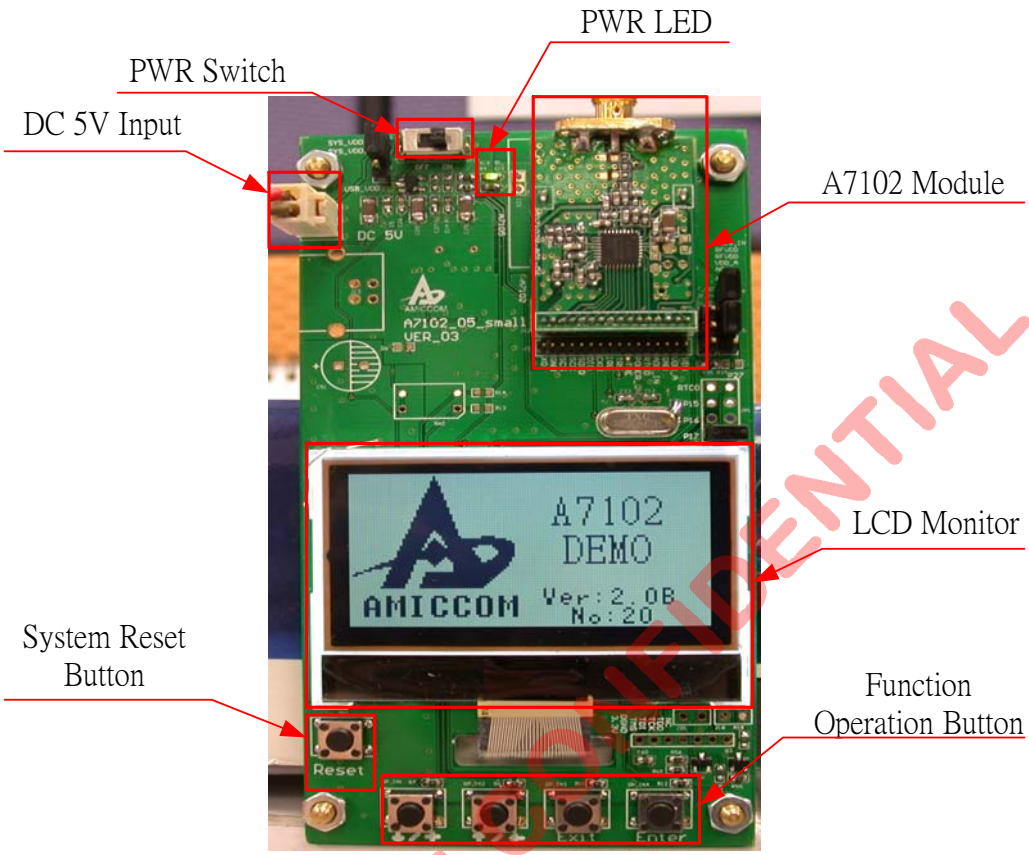

HW version B

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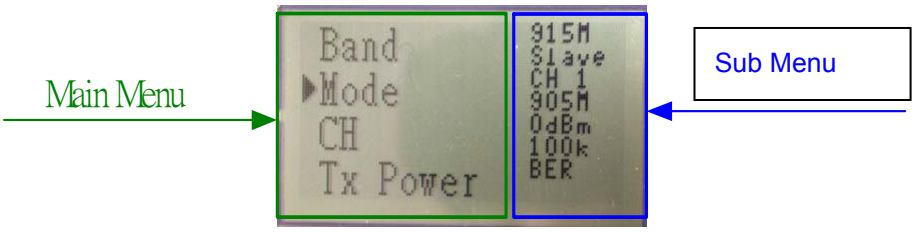
- Start Up Logo:

- **LCD Menu：**

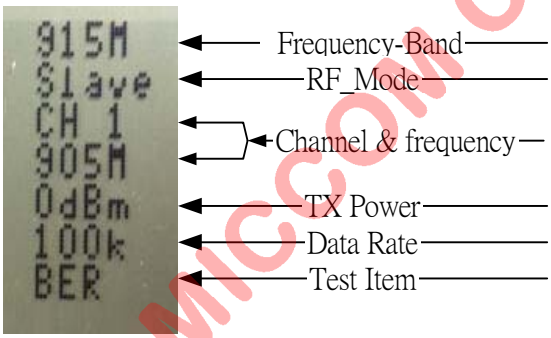
Press ‘Ent’ after turn on to entry the main menu window as shown below:



Main Menu List:

- Band : Frequency Band(315 /433 /868 /915)
- Mode : RF Mode(Master/Slave)
- CH : Channel(Ch 1 /Ch 2 /Ch3 /Ch4)
- TX Power : TX output power(0 dBm /5 dBm /10 dBm /12 or 15 dBm)
- Date Rate : 5k /25k /50k /100k
- Test Item : Data Link /BER Test/Direct Mode/Sequence Dot

“Sub Menu” will show the message which user was setting:



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- **Buttons:**

There are 4 buttons on DK board, they are:

- ↓ / + : to make the cursor downward or incremental by 1.
- ↑ / ← : to make the cursor upward or the place shift leftward.
- Exit : to exit current state.
- Enter : to entry or confirm.

◆ Function Decription：

● Band：

Press '↓' or '↑' to move the cursor to 'Band' item (as fig-1) and then press 'Enter' to move the cursor to Sub Menu (as fig-2). Press '↓' or '↑' to select the frequency you want (like 315M, 433M, 868M, 915M), then press 'Enter' .The cursor will go back to main menu for next step.

If we press 'Exit', there would be nothing changed, and the cursor will go back to main menu for next step.

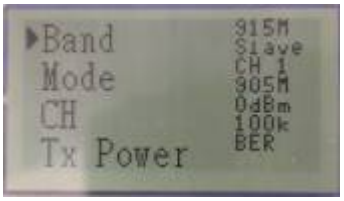

Fig - 1

Main Menu for Band

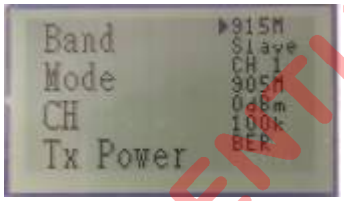

Fig - 2

Sub Menu for Frequency

● Mode：

Press '↓' or '↑' to move the cursor to 'Mode' item (as fig-3) and then press 'Enter' to move the cursor to Sub Menu (as fig-4). Press '↓' or '↑' to select Master or Slave and then press 'Enter' to set the RF mode. The cursor will go back to main menu for next step.

If we press 'Exit', there would be nothing changed, and the cursor will go back to main menu for next step

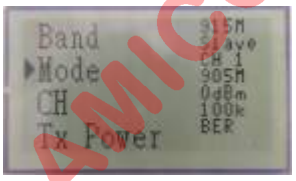

Fig - 3

Main Menu for Mode

Fig - 4

Sub Menu for Master or Slave

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- CH(Channel)：

Press '↓' or '↑' to move the cursor to 'CH' item (as fig-5) and then press 'Enter' to move the cursor to Sub Menu (as fig-6). Press '↓' or '↑' to choose the channel with different frequency as below tables shown:

➢ 315 MHz

	Master Mode	Slave Mode		
Data Rate		150K	100k	50k/25k/2k
CH1	315.2M	314.9M	315M	315.1M
CH2	315.4M	315.1M	315.2M	315.3M
CH3	315.6M	315.3M	315.4M	315.5M
CH4	315.8M	315.5M	315.6M	315.7M

➢ 433 MHz

	Master Mode	Slave Mode		
Data Rate		150K	100k	50k/25k/5k
CH1	433.2M	432.9M	433M	433.1M
CH2	433.4M	433.1M	433.2M	433.3M
CH3	433.6M	433.3M	433.4M	433.5M
CH4	433.8M	433.5M	433.6M	433.7M

➢ 868 MHz

	Master Mode	Slave Mode		
Data Rate		150K	100k	50k/25k/5k
CH1	868.2M	867.9M	868M	868.1M
CH2	868.4M	868.1M	868.2M	868.3M
CH3	868.6M	868.3M	868.4M	868.5M
CH4	868.8M	868.5M	868.6M	868.7M

➢ 915 MHz

	Master Mode	Slave Mode		
Data Rate		150K	100k	50k/25k/5k
CH1	905.2M	904.9M	905M	905.1M
CH2	910.2M	909.9M	910M	910.1M
CH3	916.2M	915.9M	916.M	916.1M
CH4	922.2M	921.9M	922M	922.1M

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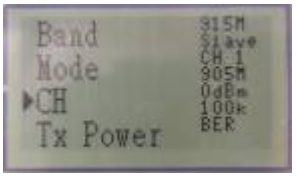

Fig - 5
Main Menu for Channel

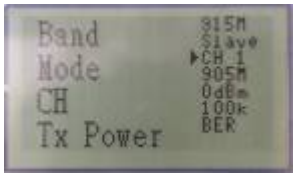

Fig - 6
Sub Menu for Channel Number

To press 'Enter' to set the channel and the cursor will go back to main menu for next step.
If we press 'Exit', there would be nothing changed, and the cursor will go back to main menu for next step.

※ Due to the limitation of LCD display field, the actual frequency should be the frequency on display plus "0.001 MHz". For example, if the frequency on LCD display is 905.2MHz, then the actual frequency should be 905.201MHz.

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- Tx Power：

Press '↓' or '↑' to move the cursor to 'Tx Power' item (as fig-7) and then press 'Enter' to move the cursor to Sub Menu (as fig-8). Press '↓' or '↑' to select the TX output power with different frequency as below table shown:

315MHZ	433 MHz	868 MHz	915 MHz
0 dBm		0 dBm	
5 dBm		5 dBm	
10 dBm		10 dBm	
15 dBm		12 dBm	

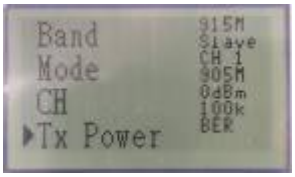

Fig - 7
Main Menu for Tx Power

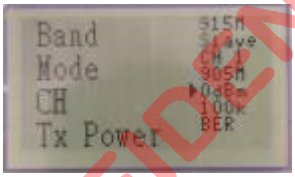

Fig – 8
Sub Menu for Power Level

, and then press 'Enter' to set the 'Tx Power'. The cursor will go back to main menu for next step.
If we press 'Exit', there would be nothing changed, and the cursor will go back to main menu for next step

- Data Rate：

Press '↓' or '↑' to move the cursor to 'Data Rate' item (as fig-9) and then press 'Enter' to move the cursor to Sub Menu (as fig-10). Press '↓' or '↑' to select the Data Rate you need (5k, 25k, 50k, 100k) and press 'Enter' . The cursor will go back to main menu for next step.

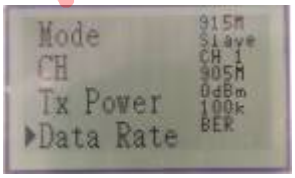

Fig - 9
Main Menu for Data Rate

Fig – 10
Sub Menu for Data Rate Selection

If we press 'Exit', there would be nothing changed, and the cursor will go back to main menu for next step.

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- Test Item：

Press '↓' or '↑' to move the cursor to 'Test Item' item (as fig-11) and then press 'Enter' to move the cursor to Sub Menu (as fig-12). Press '↓' or '↑' to select the test item you need (as following shown) and press 'Enter'.

1. BER(Bit Error Rate).
2. Data(Data Link).
3. Direct(Direct mode),
4. Dot(Sequence Dot).

Fig - 11
Main Menu for Test Item

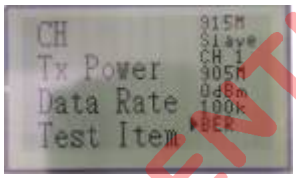

Fig – 12
Sub Menu for Test Item Selection

The display of each test item is just as following shown:

DATA Link:

When we entry the Data Link test item, we can see the display as Figure-13(For Master) and Figure-14 (For Slave),

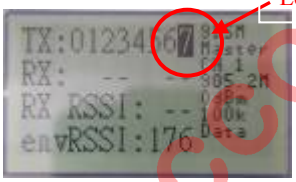

Fig - 13

Fig – 14

There is an edit cursor on the 'TX:' field to edit the TX. Press '+' to increase the number progressively; Press '←' to move the cursor and press 'Enter' to send out the content of TX.

If we did not edit the content of TX and press 'Enter' directly, the DK will random come out a set of data on the field of TX and send out it out.

DK will wait for the response from another DK after sending out the data, and show the receiving data on the field of RX and 'RX RSSI' when got response (as fig-15). If DK didn't get any response, it will show 'Fail" and no 'RX RSSI' on the field of RX (as Fig-16).

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Fig- 15

Fig– 16

The format of Data Link package is as following:

1. 4 byte ID : 0x0A,0xC5,0x2A,0x75
2. 2 byte command : 0x01, 0x01
3. 4 byte Data : Data1, Data2. Data3. Data4

DK will receive the package when the setting was follow above format and had correct frequency and Data rate.

BER TEST:

✧ Master

When we entry the Data Link test item, we can see the Master display as Fig-17. There is an edit cursor on the 'TEST#:' field to edit. Press '+' to increase the number progressively; Press '←' to move the cursor and the scope for editing is "100 ~ 59900". After editing, to press 'Enter' to entry the link picture as fig-18 shown.

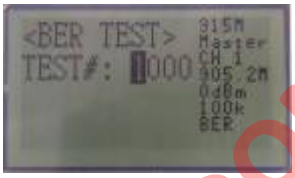

Fig - 17

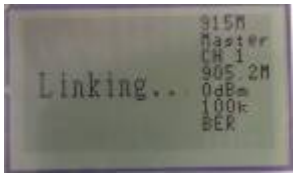

Fig – 18

※ If the input testing package is zero, it will occur 'NO ERROR' alarm after pressing 'Enter'. To press 'Exit' to go back the editing picture.

Master DK will start to transmit the test package after finish the link with Slave DK and the content of the package is 64 byte PN9 Code (see Fig-19). Master DK will receive the test report from Slave DK and the report will be shown on the display. The backlight of monitor will be flashed at this time, we can press any key to stop the backlight flash and press '↓' could read the whole report. Please see Fig-20,Fig-21,Fig-22.

Fig - 19

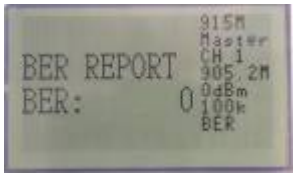

Fig - 20

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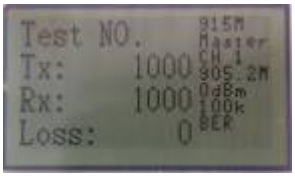

Fig - 21

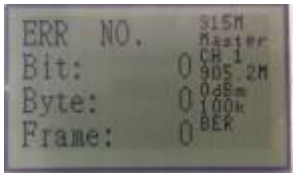

Fig - 22

Press ‘Exit’ to back BER test status and press ‘Exit’ again to go back to main menu for next step.

✧ Slave

When we entry ‘BER test’ test item, Slave will get into Link status (see Fig-23), Slave DK will start to receive test package after finish the link with Master DK, and it will show the receive numbers (RX#), BER, RX RSSI, and environment on the monitor (see Fig-24).

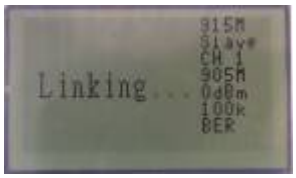

Fig - 23

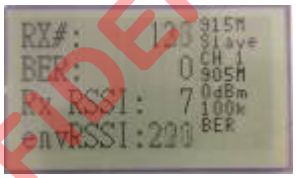

Fig - 24

Slave DK will send the test report to Master DK after finish receiving the test package and the report will be shown on the display. The backlight of monitor will be flashed at this time; we can press any key to stop the backlight flash and press ‘↓’ to read the whole report. Please see Fig-25,Fig-26, Fig-27.

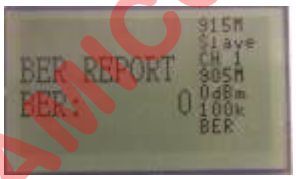

Fig - 25

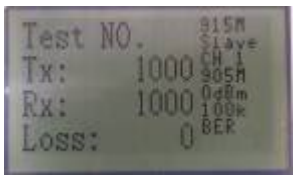

Fig - 26

Fig – 27

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Press ‘Exit’ to back BER test status and press ‘Exit’ again to go back to main menu for next step.

BER Formula:

If the BER test result is same as Fig- 25, Fig- 26, Fig - 27. It tells us that no any package got lost or error and BER is zero. If the test results are as Fig-28, Fig-29, Fig30,

Fig - 28

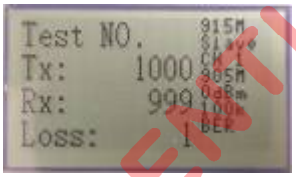

Fig - 29

Fig - 30

It means as following:

1. Among the transited 1000 packages, only 999 packages were received and one got lost. (See Fig-29)
2. There were 3 packages with error among the received 999 packages.
3. There were 27 bytes with error among the 3 error packages.
4. There were 77 bits with error among the 27 error bytes. (See Fig-30)
5. Each test package contains the PN9 test code with 64 bytes.

So the formula for BER is as following:

(Lost bits + Error bits) / Receivable bits = BER

((1 * 64 * 8) + (77)) / (1000 * 64 * 8) = 0.00115 ≒ 1.2E-03

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Direct Mode:

✧ Master

When we entry the ‘Direct Mode’ test item, the Master display is as Fig-31 shown, and we have to choose the source from ‘A7102 DIO’ input signal pin. ”INTERNAL” means the input signal came from DK A7102 self-generated (the signal type is 0101).’External” means the input signal came from external input.

Press ‘Enter’ to choose the DIO source we need and then active the ‘Direct mode’ test. (See Fig-32) When DIO input signal is Internal, DKA7102 will generate the 0101 signal corresponding to the data rate that user set and input to ‘DIO’ pin. When DIO input signal is External, user should input the signal to DIO pin by themselves. (Please see the red frame on Fig-33)

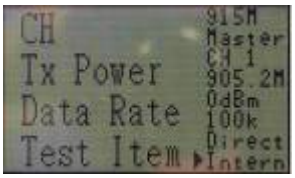

Fig - 31

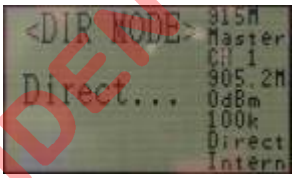

Fig - 32

Fig - 33

Fig - 34

✧ Slave

When we entry the ‘Direct Mode’ test item, the Slave display is as Fig-34 shown. The DIO pin will output the input signal from Master, and below table is shown the Sensitivity of ‘Direct mode’.

Frequency(MHz)	Data rate (K bps)	Sensitivity(dBm)
915	100	-103
	150	-102
868	100	-102
	150	-101
433	100	-107
	150	-105

DK A7102 direct mode sensitivity

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Sequence Dot:

✧ Master

When we entry the 'Sequence Dot' test item, the Master display is as Fig-35 shown. The Master side will show the sequence dot and send the relative information to Slave side.

Fig - 35

✧ Slave

When we entry the 'Sequence Dot' test item, the Slave side will detect the environment RSSI and show on monitor. (See Fig -36)

When Slave side got the sequence dot data from Master side, it will show on the monitor and detect the RX RSSI, environment RSSI and calculate the PER (Packet Error Rate) as Fig - 37, Fig -38 shown.

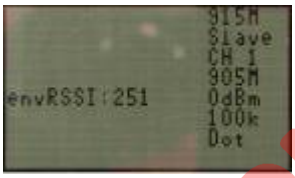

Fig - 36

Fig - 37

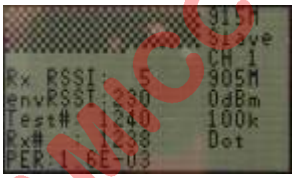

Fig - 38

PER Formula:

If the test result of Sequence Dot was just as Fig-37 shown, it means there was no any lost packages and error count and the PER is zero. If there was interference during testing , the PER is not zero as Fig-38 shown. That means RX received 1238 packages (RX#: 1238), and the actual test packages is 1240 (Text#: 1240).

The formula of PER is as following:

(Test number - RX number) / Test number = PER

(1240 – 1238) / 1240 = 1.6E-03

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